Evaluation of Alternative Carbon Fibers to Improve Joint Performance in 3D Woven Heatshields, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

Abstract

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The successful completion of the Phase I program would directly benefit the Adaptable, Deployable Entry and Placement Technology (ADEPT) and the Heatshield for Extreme Entry Environment Technology (HEEET) programs, both of which are currently focused on the use of 3D weaves in ablative TPS. The identification of an alternative fiber that could be used to both improve strength retention after exposure to high heat fluxes and eliminate the outgassing issues associated with the current use of PAN-based fibers could result in significant performance improvements for the thermal protection system. In addition, the ability to predict strengths for dry 3D woven materials would allow for additional design and analysis to be performed on various heat shield components which could reduce the amount of fabrication and testing that needs to be done to arrive at a suitable design.

To the commercial space industry:

Potential Non-NASA Commercial Applications: In addition to the potential NASA applications, there is also potential for applications within the Department of Defense (DoD). Specifically, Defense Advanced Research Projects Agency (DARPA) is currently investigating the use of 3D woven carbon fiber reinforced composites for aeroshell applications. Depending on the desired trajectory of the vehicle, it is expected that some regions of the vehicle will experience peak surface temperatures that exceed the as-received temperature of the carbon fibers. Therefore, modeling tools capable of predicting the effective material properties and strengths of 3D woven carbon fiber reinforced composites following additional graphitization of the fibers would also be very useful to this

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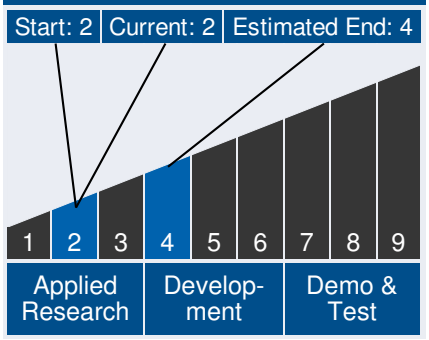
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

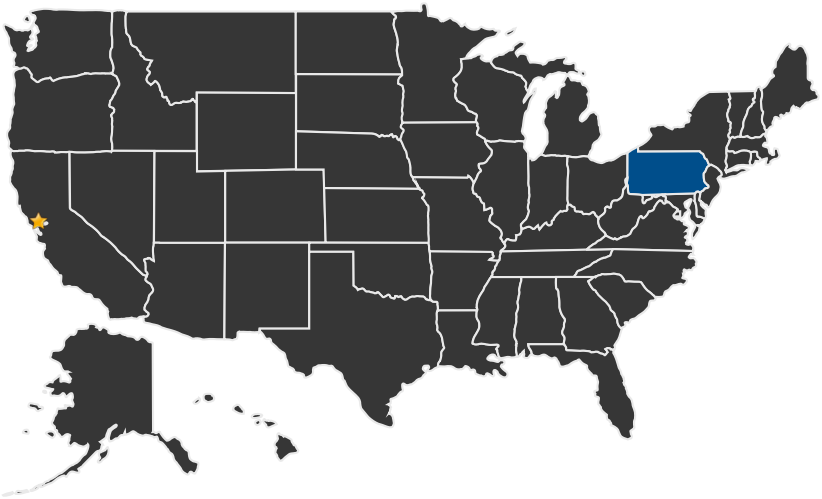
Program Manager:

- Carlos Torrez

Continued on following page.

community.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Ames Research Center

Other Organizations Performing Work:

- Materials Research and Design, Inc. (Wayne, PA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23578)

Management Team *(cont.)*

Principal Investigator:

- Kerry Howren

Technology Areas

Primary Technology Area:
Thermal Management Systems (TA 14)
└ Thermal Protection Systems (TA 14.3)
  └ Ascent/Entry TPS (TA 14.3.1)

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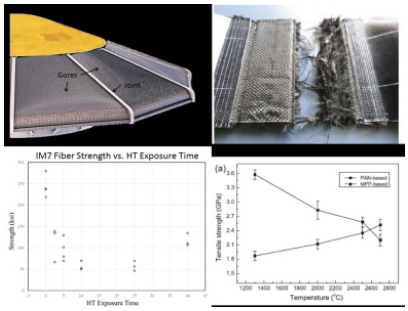
IMAGE GALLERY



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DETAILS FOR TECHNOLOGY 1

Technology Title

Evaluation of Alternative Carbon Fibers to Improve Joint Performance in 3D Woven Heatshields, Phase I

Potential Applications

The successful completion of the Phase I program would directly benefit the Adaptable, Deployable Entry and Placement Technology (ADEPT) and the Heatshield for Extreme Entry Environment Technology (HEEET) programs, both of which are currently focused on the use of 3D weaves in ablative TPS. The identification of an alternative fiber that could be used to both improve strength retention after exposure to high heat fluxes and eliminate the outgassing issues associated with the current use of PAN-based fibers could result in significant performance improvements for the thermal protection system. In addition, the ability to predict strengths for dry 3D woven materials would allow for additional design and analysis to be performed on various heat shield components which could reduce the amount of fabrication and testing that needs to be done to arrive at a suitable design.